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## **Closing the gap: the link between social capital and microfinance services**

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# Closing the gap: the link between social capital and microfinance services

*Rodolfo De la Torre and Patricia Lopez-Rodriguez*

## **Abstract**

*The social capital has strengthened the solidarity funds when the legal mechanisms and institutions for monitoring and assistance would not have been present. The aim of this paper is to analyze the effect of social capital on productivity and performance of the Mexican solidarity funds. For this it is obtained an estimator indirectly associated with inequality, through which it follows that if the social capital rises 1% the loans number increases by 0.2877% and the savings number increases by 0.4598%, and for each additional producer that activate his social capital with his partners they will be generated increases in loans recoveries amounting to 597.41 pesos. In this sense, a greater investment in social capital will recover a larger amount of borrowed funds and will increase savings and loans to poor producers.*

## **1. Introduction**

Access to formal financial services by the poor is inaccessible or difficult considering that the poor do not have guarantees or collateral. The credit risk they entail and the resulting high interest rates they have to pay contribute to exclude them from the formal markets. Microfinance schemes that operate with social capital provide substitutes in terms of the social collateral and low-cost alternatives for lenders. Social capital is known as a set of individuals' characteristics that allow them to trust each other, cooperate and form networks useful for solving economic problems.

The social capital in microfinance facilitates access to credit and improves the performance of its financial operations. This allows microfinance schemes to achieve financial sustainability by raising their recoveries and reducing transaction costs and monitoring. The social capital in microfinance operates through information flows and better members' selection, thus diminishing frauds and the risk of bankruptcy.

The central objective of this paper is to analyze the effect of the social capital in the performance of the solidarity funds, on the understanding that greater social capital improves access to financial services to promote microfinance schemes. This could be relevant considering that there is little access to financial services in Mexico, especially within the poor. This analyses if social capital is productive and affect positively the solidarity funds performance.

Since it is not possible to directly measure the social capital it is associated with an indicator that relates inversely the social capital with inequality. In order to relate social capital with microfinances indicators an extrapolate method is used to get social capital indicators at municipal level through income inequality index. For this purpose the following hypothesis are explored: a) social capital can be estimated through an inequality index; b) The social capital affects the productivity, and c) social capital affects the financial performance of the solidarity funds.

To test the first hypothesis it is estimated the social capital through an inequality index. The estimations are made with two methods and four indexes: Robin Hood, Variation Coefficient,

Gini and Relative Deprivation. The first method is based on a theoretical model that defines its nonlinear functional form. The social capital indicator consists of the resources offered by a person and it relates theoretically with a coefficient of sympathy which represents the degree to which a person joins the welfare of another in its utility function and that leads to share resources with other. The second method is the estimation of a linear equation that incorporates both a trust indicator from the World Values Survey and each of the four inequality indexes. From the statistical results it is inferred that the best social capital estimator is the coefficient of variation.

To test the second and third hypothesis financial indicators from the solidarity funds and the estimator of social capital obtained are considered. Two equations are estimated to show the effect of the social capital in the solidarity funds products (savings and loans). Productivity is estimated by the degree of dependence of the loans on fund lending and social capital and dependence of the savings on the assets and social capital. To test performance it is proposed an equation that measures the dependence of the borrowed funds recoveries on loans average and social capital. The equations are represented by Cobb Douglas production functions and the social capital is incorporated as an indirect factor associated with the job.

From the first equation estimation it is inferred that the number of loans depends positively on lending funds and social capital. In this way it is obtained that the higher social capital and the higher amount of resources available in the Solidarity funds the greater the number of loans to be granted. From the second equation estimation it is inferred that the number of savings transactions depends positively on assets and social capital. Thus, the provision of greater resources through the expansion of assets generates greater savings; and higher social capital will produce greater trust to deposit resources in the solidarity funds.

From the third equation estimation it is inferred that recoveries of the borrowed funds are dependent on average loans and social capital. Then it is obtained that social capital affects positively the performance of the Solidarity funds via recoveries and these recoveries present a diverse behaviour when the average loans increase. Therefore, it is inferred that social capital has an effect on productivity and financial performance of the Solidarity funds.

The main outcome of this paper is that an increase of 1% on members' social capital increase loans in 0.29% and increase savings transactions in 0.46%, while each additional unit of social capital retrieve loans in 597 pesos, which otherwise would not be paid. In the process of achieving these results, it is confirmed that greater inequality in income distribution is associated with a lower trust among solidarity funds members, that is, with less social capital.

The structure of this article is made in 10 sections. In the second section explains the definition of social capital and its different meanings, the definition to be used and the methodologies for its measurement. In the following section are described some reasons for the restricted access to the financial system of the poor. In section four describe the operation of the solidarity funds and its relationship with social capital. In section five there are described indicators of the financial solidarity funds. In the section six it is described the methodology and data sources for estimating the social capital. The section eight develops a theoretical model that underlies the functional form and basis for estimating the relationship between capital capital and inequality. In section nine some estimators are obtained and the working hypotheses are developed in addition to the estimated econometric equations. Finally section 10 concludes.

## ***2. Definition and measurement of social capital***

The social capital concept is relatively recent, developed by Pierre Bourdieu in the 1970s and early 1980s, as such may be placed in the first half of the 20th century and its applications in the past 20 years. In the past, the concept was part of the skills, experience and knowledge that people used in isolation to transform into a productive process and human relations were found exclusively in the social structure. As Coleman (1988) established the relationships, when people try to make better use of their resources, are not only components of the social structure but resource for people.

Social capital refers to networks, norms and trust that facilitate cooperation for mutual benefit (Putnam, 1993). Social capital fosters reciprocity norms, allows the coordination and communication by creating channels through which information can flow from individuals, tested and verified. Contributes to solving problems of collective action and reduce the incentives for opportunism.

The social capital concept is based on trust what distinguishes it from legal and political bodies and civil society. Including customs and forms of association that are spontaneous and not necessarily dependent on laws. Through the trust promotes cooperation and contributes to the achievement of agreements that involve risks in making decisions. Trust allows reducing costs associated with the formation and negotiation of agreements.

In the literature there are two sides to discuss the concept; the first is linked to the way in which resources are obtained. The information, ideas and support that people can obtain through the relationship with other persons are considered as capital. Another type of capital is obtained in different ways such as physical or human which are essentially property of the people and not depend on others. The second concerns the nature and extent to which people engage in various informal networks and formal civic organizations. The term here is used to characterize the different ways in which individuals interact.

The concept also has three ways to interface to access resources. The first relates to the “bonding” social capital –show the bonds of people on the basis of their sociodemographic characteristics such as those that occur between family members, neighbors, close friends and coworkers. The second relates to “bridging” social capital –are the bonds between people that relate mainly in groups with similar characteristics. The third relates to “linking” social capital –show the ties that a person uses with a position of authority to get resources, as a public representative (police, political party leaders) and institutions (banks, security agencies) (Gittel and Vidal 1998, Narayan 2002, Putnam 2000, Woolcock 1999).

The “bridging” social capital is perceived as horizontal, while “linking” social capital is more vertical, connecting people to resources and key economic institutions. In the case of “linking” social capital is not the presence of the institutions which is an asset but the nature and extent of social bonds between customers and suppliers, many of which are inherently a way to get resources and/or services.

Not always these three forms of social capital are used with positive effects they can be used for harmful purposes; for example, some exclusion rules are made to deny access to people to a service. The “linking” social capital can also be despotic or a mechanism for political

favoritism. Then not always the different dimensions of social capital provide useful results for the generation of goods and services.

From the scope, social capital definition also distinguishes two types (cognitive and structural) and two dimensions (macro and micro) (Grootaert et al 2002). The breadth of the concept has been seen as a sign of strength and weakness. The weakness lies in being a multidimensional concept, it could be too broad to provide specific conclusions about individual behavior or more complex structures. The strength lies in the complementarity and substitution levels.

The definition of social capital considered here is the following: “The sympathy that a person has towards another that causes that one offers social capital. People who offer social capital generate benefits, advantages and preferential treatment to others” (Robison and Siles, 1997). There are three reasons for adopting the above definition; on the one hand it takes into account the positive aspect of the concept. Secondly, it considers a micro level approach: a set of individual preferences that incorporates the well-being of others in the own welfare. Thirdly, it distinguishes what social capital is from what it makes and where it resides (Robison, Siles and Schmid, 2004).

The lack of an agreed definition of social capital, combined with multidisciplinary approaches generated different interpretations and ways of estimating the concept. How to measure social capital? Depends on how it is defined. Depending on the definition, some indicators may be more appropriate than others.

Because definitions of social capital are multidimensional, incorporating different levels and units of analysis, such as organizations, and community networks, this makes it difficult to obtain a single measure of social capital. As a result, there are created indexes that approximate estimates of social capital. However, there is a risk to generate these measures could end up capturing different dimensions to the original concept.

One way to find a balance between these measures is to decompose the concept into its different dimensions and thus generate new comparable data sets. Some of the dimensions of social capital relate to the size (the number of people with social capital), geographical dispersion, density/integration, composition and homogeneity of members, frequency of contact between members, strength of ties (degree of intimacy, reciprocity, expectations of durability and availability), social participation and social anchorage (years of residence, neighborhood and community participation). There is also a risk in using these dimensions, it is to mix the determinants with the results, and sometimes its determinants could be even their results (eg. health and cultural diversity).

In the literature (Grootaert, C., y van Bastelaer Th., 2002), the indicators generally used to measure social capital are trust in people or governments, culture, sympathy, affinity, solidarity, friendship, membership in civic organizations, time to maintain public services and conflict resolution, collaboration or cooperation with others, social mobility, social participation, social skills, building networks, shared norms, sense of obligation toward others and volunteering, among others.

However, indicators that measure participation and membership to groups vaguely capture the social capital by counting only the percentage of the population that belong to an

organization. Participation in an organization can have different degrees, for example active membership is different than simple membership and within the active membership will be in a different way the degree of participation in terms number of personal contacts and time spent on solving common problems.

Additionally, membership in an organization can reflect past investments in social capital and not the current state of the capital, contacts in an organization may differ depending on time in the organization or its investment in real capital. Thus, the membership may reflect a high level of social capital or a high depreciation. Also belonging to an organization not imply affinity or increased participation and being a member of more than one organization does not necessarily have more value in terms of social capital than a greater involvement in one organization. Moreover, if a person belongs to an organization tends to generate positive externalities while individual status tends to generate negative externalities, especially when it is a zero-sum game.

In relation to the confidence or trust indicators they can generate aggregated social capital but not necessarily are good measures of individual social capital, for example if people trust in another it does not necessarily imply reciprocity, then if people does not have a repayment for his trust so to be more trusted will not be individually more productive.

Usually social capital indicators are obtained from surveys, for example, some indicators like trust and civic cooperation are obtained from the World Values Survey (Knack and Keefer, 1997). Others like newspaper readers, membership in associations like football and coral clubs and confidence in public institutions come from the General Social Survey (Putnam, 1995). Teachers, Paasche and Carver (1997) used parent participation in meetings of community organizations, church youth groups involving their children and parental involvement in school affairs from the National Educational Longitudinal Survey.

Although there are surveys where social capital indicators can be obtained it has not been possible to get a single variable to its measurement, this is due to several reasons: 1) definitions of social capital are multidimensional with different levels and units of analysis, 2) any attempt to measure concepts such as trust, networks, collaboration, participation and organization is problematic, mainly by lack of agreement about its meaning, 3) few long-term surveys are designed to measure social capital so as to compare results over time, and 4) some social capital indicators are only at national level but not in more disaggregated units of analysis like at the municipal level as the case of measures of trust in government, voter trends, members of civil society organizations, hours given to voluntary work.

Other social capital indicators are obtained through approaches to other variables. The variable commonly used is inequality, measured by different indices: Robin Hood, coefficient of variation. There is evidence of a strong negative correlation between social capital and inequality although there is not defined the causal relationship, usually social capital explains a more equitable income distribution (Coleman, 1988) but in others income inequality explains social capital for example Knack and Keefer (1997) and Putnam (2000) where the decrease in inequality leads to more investment in social capital.

Some other studies relate social capital with income measures, for example Boisjoly, Duncan, and Hofferth (1995) measure social capital through the monetary and time support received for a household from family and friends, they found that people with higher incomes have

greater access to cash assistance and people with low incomes have greater time help. Narayan and Pritchett (1997) estimated social capital with the extent and characteristics of people associational activity and their confidence in various institutions and individuals, this measure was associated with data from household income in rural communities, they found that social capital increases household income.

Other studies relate social capital with inequality measures, for example Kawachi, Kennedy, Lochner, and Prothrow-Stith (1997) estimated social capital with solidarity groups' density and the portion of individuals who believe that people could be confident. They inferred that investment in social capital reduces income inequality. Robison and Siles (1997) used as social capital indicators family integrity (percentage of households with female heads with children), educational level (percentage of graduates from high school), crime variables (rates of litigation) and employment variables (rates of labor force participation), they found that social capital changes have an effect on the level and disparity of household income.

The most common forms of social capital investment consists in share a social network, these networks can be formed by different types of people with common characteristics and have minimum social distance. People who have these characteristics create trust, loyalty and cooperation which could lead to flows of information, saving time and resources in physical and monetary terms.

There is empirical evidence of this kind of social capital investment like the networks built through microcredit groups (Knaff and Keefer, 1997, Narayan and Pritchett 1997, Temple and Johnson, 1998; Portes, 1995; Karageorgis and Light, 1994, Heller, 1996 ). These studies show that social capital generates information channels, facilitates transactions and reduces costs in these credit mechanisms. For example, lack of access to credit for the poor in developing countries is a consequence of the limited information and the risk that the credit applicants imply. Through social capital agreements are obtained and these problems are reduced in the imperfection of information and therefore the credits are provided. Networks and trust attitudes reduce the opportunistic behavior of some community members, for example the peer pressure mechanism in microfinance is used to prevent default problems. Using this tools social capital will be analyzed and measured.

### ***3. Characteristics of financial exclusion***

In Mexico there is limited access to formal banking services and delays in funding. For example, financial intermediaries, including banks, are serving less than 40% of the population and 77% of users know little of the bank contracts. The alternative of expanding the popular financial sector to cover the 60% remaining has had poor results and the Popular Savings and Credit Law (LACP) recently approved has created obstacles to financial intermediaries that serve this sector. On the one hand, the approval has reduced costs but also has decreased the flexibility to be adapted to the needs of this population<sup>1</sup>.

The microfinance sector has not achieved a greater coverage and penetration in Mexico, especially in rural areas, for example 80% of people from rural communities use cash as the only mean of payment, the savings system with more penetration is the informal through the Rotating Savings and Credit Association or ROSCA, "home savings", solidarity cooperatives

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<sup>1</sup> Survey of Financial Culture in Mexico, 2008. Banamex-UNAM.

for savings and savings with friends and parents. The 69% of the population lacks information on financial products and services. This sector has failed to adapt their products to local demands and present problems of past-due loans, 77% of financial services users say they know and understand little or nothing of the contracts in this sector, 2 of 10 people surveyed had a record of their debts, expenses, income and savings, and 7 of 10 people are not informed about services and charges of financial instruments (BANAMEX-UNAM) <sup>1</sup>. Additionally, the creation by the sector of new technologies and products (which is limited) has been based on different characteristics of financial infrastructure.

The formal financial services access for poor people is difficult considering that they don't have guarantees. The banks have no interest in small crops, animals, or appliances. In some cases, poor people have an acceptable guarantee (their lands), however, they can not use them because the lack of a legal property title, the same goes for the mortgage (Mansell, 1995). Therefore, banks are based just on the credit history (information missing in the case of the poor) or in the income level (which is usually irregular considering the unemployment periods). The lack of information and the credit risk of these borrowers, in addition to high interest rates and the situation described above exclude the poor from the formal financial markets.

Many times transaction costs may be higher on loans for the poor than for higher income individuals because the credit monitoring and contract enforcement are more difficult for the poor. Alternatively lenders raise the interest rates to a certain level<sup>2</sup> to cover their costs. Thus, financial intermediaries in equilibrium ration the credit giving this to customers that imply less research and monitoring costs and whose contracts are cheaper to enforce. Even in the informal financial sector interest rates do not balance the markets<sup>3</sup> and credit rationing exists.

Moreover, the transaction costs facing the poor are also large. The cost in time for the poor is also high. As there are few intermediaries from the formal financial sector in low-income areas, if poor people go to the bank may cause a few hours off from work, it could also represent to walk long distances, take several transport and, quite possibly, make long lines. May involve also filling forms difficult to understand, time and effort to gather the required documentation. These reasons explain why low-income borrowers are not only excluded from credit markets in the formal sector but also from many informal sources of financing.

#### ***4. Social capital in the solidarity funds***

Social capital in microfinance works through ties of solidarity, neighborhood and community organization, its principal asset is the trust (Coleman, 1990) and operates through the social collateral, peer monitoring and peer pressure. Mechanisms that foster linkages and strengthen their solidarity bonds are the selfselection, groups of small size, the homogeneity among the members and their population density (Bastelaer, 1999). Social capital in microfinance provides substitutes with respect to individual collateral and generates low-cost alternatives for lenders.

Social capital is expressed in the solidarity funds on participation and how this financial instrument is set up: the producers met voluntarily to establish the funds. The members are

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<sup>2</sup>The interest rates are raised until the level that the highest marginal rates increase the probability of default, which would reduce their profits.

<sup>3</sup> Some times up to 10% per day.



involved in the process of creation and modification of statutes and operation rules, they are also involved in the designing, monitoring and evaluation process, which reduces their costs. They decide who can become a member because they have information about the members of their communities.

The members are also the owners and those responsible for recovery. Using the peer monitoring and peer pressure schemes they can reduce the fraud or default problems. The member's participation in the creation, discussion of operation rules, organization and monitoring enables them to adapt to the specific needs and expectations of the members. Members participate attending meetings with all the members involved to take decisions on the issues concerning to the group.

The funds representatives are selected in the General Assembly members by majority vote, their positions are honorary in nature and therefore not remunerated for their performance. Members may be elected to any administrative post or representation. The members through the local credit committee decide who can be a member among themselves as they are known. But they can also deny entry of a person when the applicant is known for his dishonesty and disrepute in the community. This selection mechanism has a positive effect in preventing risks of fraud or default problems.

These members represent the social guarantee that applicants need to obtain a loan. For example, in the case of solidarity loans the members could be the social collateral for loans. Also members are responsible for monitoring the performance of their managers and the use of its funds through the supervisory boards, management and credit committees. The funds keep a record of each member in addition to the books and the register of members at meetings. This monitoring tool allows the management team transparent attempts to minimize fraud and providing security to the members.

The operation system of the funds has its own implicit social oversight mechanism. Some attempted fraud has been avoided. However, in the case of fraud or default the board of directors temporarily suspended or expelled them from the Fund. But the punishment goes beyond an economic fraud, it is a social destitution preventing their access to various community activities and limiting their access to the benefits of public services and assets created with the resources of the funds.

Responsibility and trust between members allows getting loans without excessive collateral. To the extent that customers are also owners and correspondents of the fund administration, it reduces the temptation not to pay and reduces the presence of fraud. In the event they were presented their social system controller can detect them in time. This situation reduces the risk of bankruptcy preventing its spread to other funds from other regions.

On the other hand, the solidarity funds do not have the permission of the National Banking and Securities Commission (CNBV by its initials in Spanish) to operate as entities of Savings and Loan Associations (EACPs by its initials in Spanish) in terms of the the Popular Savings and Credit Law (LACP by its initials in Spanish) because they are civil societies. They are not subject to the approval of the Ministry of Finance and Public Credit (SHCP by its initials in Spanish), or the inspection and supervision of the CNBV, or are located in the rules of the

Savings and Loan Societies (SAPs), but they have auxiliary supervision and technical assistance from a Federation<sup>4</sup> and are considered by the LACP.

The funds have not been able to adjust their operation to the requirements established by the LACP, they are not required to comply with prudential rules as they apply only to entities that are subject to regulation by the SAPs and CNBV as credit unions or well as public financial institutions like Banrural.

The funds are not SAPs because the requirements are costly and complicated for them. For example, they are obliged to contract managers and administrators with five and ten years of work experience, the call for its annual meetings have to be published ten days in advance in the newspapers of greatest circulation in the area, and the opening hours are rigid, Monday to Friday and weekends remain closed.

These requirements are difficult to fulfill in most of the funds. First, because there are populations in which the low level of education of its members is very difficult to secure staff with technical training, second, by its geographical dispersion, many of these communities have no access to newspapers or the media, and third, as regards the schedule, the weekend is when the members of the country side and surrounding communities come to town, where usually the offices of the solidarity funds are installed.

This status limits the financial development of the funds and prevents them from having the backing of the banking authorities, this still is not an obstacle to their development, but may be in the future. So, while for internal management, the funds do have statutes and rules of operation approved by the membership, it is necessary that they are supported and count with an appropriate legislation. In this sense, social capital has a special advantage on the legal aspect of the solidarity funds, its mechanisms of operation, supervision and control of funds gives them confidence and certainty to the partners on the use and recovery of resources, which could not be done otherwise, because its legal situation they can not be govern under other statutes, and do imply a high cost for the funds or change their social denomination. In this sense, the mechanisms for participation, selection, supervision and monitoring act as substitutes for legal mechanisms and oversight.

### ***5. Income transfers and social capital model***

Social capital has been estimated through opinion surveys and indirect measures like inequality indices such as the Robin Hood index and the coefficient of variation. The results have shown that income inequality is negatively associated with social capital which suggests that inequality, through a suitable functional form, can be a proxy of the social capital.

In order to find a theoretical proxy of the social capital through its relationship with inequality it will be used the following model. This shows the inverse relationship between social capital and inequality, through four indexes: Robin Hood, coefficient of variation, Gini and relative deprivation. The indicator of social capital consists of the resources offered by a person and relates theoretically with a coefficient of sympathy. This represents the degree to which a person incorporates the welfare of another in his utility function and that leads to sharing resources with other.

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<sup>4</sup> Federación Nacional de Cajas Solidarias, A.C.

In this way Social capital is observed in the transfer of income, an individual with more income is concerned about an individual with less income because there is a relation of sympathy between them (if there is positive social capital). The individual with more income is interested to raise the welfare of the other with less income by transferring part of his income, generating thus a redistribution of income inequality that favors the worse. This behavior is pleased for both because the higher income individual raises his social capital invested in the poorer individual, and therefore his utility, and the individual with less income is receiving a transfer.

In this model there are two individuals ( $i$  and  $j$ ) with equal utility functions, Cobb-Douglas type. Their functions depend on the final income itself ( $If_i$ ) and the final income of another individual ( $If_j$ ), which in turn depends on the amount of social capital between the two that is represented by a coefficient  $K$ . If social capital is positive an increase in the income of individual  $j$  will give satisfaction to individual  $i$ , the opposite happens when social capital is negative, when  $K=0$  any change in the income of  $j$  is indifferent to  $i$ . In this model social capital is assumed positive. The following are the utility functions for individuals  $i$  and  $j$ :

$$U_i = If_i If_j^K \quad (1)$$

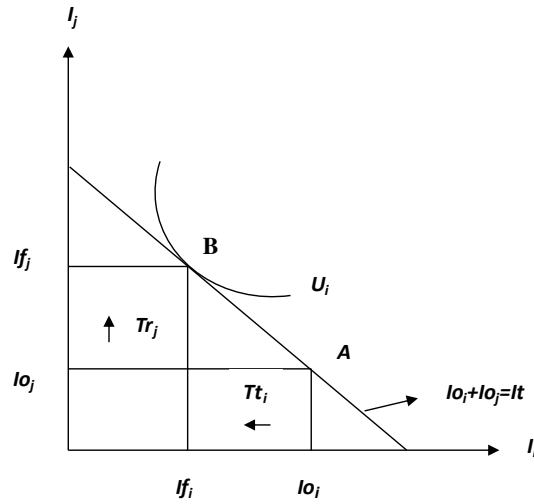
$$U_j = If_j If_i^K \quad (2)$$

It is assumed that social capital is equal for  $i$  and  $j$  individuals ( $K_{ij}=K_{ji}=K$ ) since the two individuals feel sympathy for one another in the same way. The income elasticity is given by the social capital coefficient  $K=(\partial U_i / \partial If_j)(If_j/U_i)$ , and lies between 0 and 1 ( $0 < K < 1$ ), i.e. each individual appreciate the other, but do not appreciated him as well as himself. If  $K < 1$ , the individual  $i$  appreciate more an increase of one percent of his final income than an increase of one percent of the final income of the individual  $j$ . If  $K=1$ ,  $i$  appreciate the final income of  $j$  as much as himself, if  $K > 1$  is more important for  $i$  the final income of  $j$  than his personal income, if  $K=0$  individual  $i$  does not appreciate to  $j$ .

The final income of  $i$  and  $j$  individuals is given by the sum of the initial income ( $Io$ ) and net transfers ( $Tn$ ), i.e. what an individual has minus the amount of transfers he gives ( $If_i=Io_i+Tn_i$  y  $If_j=Io_j+Tn_j$ ). These net transfers consist of transfers received ( $Tr$ ) minus transfers given ( $Tt$ ) ( $Tn_i=Tr_i-Tt_i$  y  $Tn_j=Tr_j-Tt_j$ ). Individuals will only differ from each other by their initial incomes, i.e., at the beginning there is inequality in their allocation of income.

In this model it is assumed zero transaction costs, i.e. transfers which gives the individual  $i$  are equal to the transfers received by individual  $j$ , in turn, transfers received from the individual  $i$  are equal to those granted by the individual  $j$  ( $Tr_j=Tt_i$  y  $Tr_i=Tt_j$ ). In this model the total income of individuals does not change otherwise income distribution could be affected by factors other than transfers, therefore, the income of the economy is fixed, the amount of final incomes of  $i$  and  $j$  is equal to total income of the economy ( $It=If_i+If_j$ ). In this economy, each individual transfers part of his income to another according to his preferences, thus generating a reallocation of income. The following explains the distribution graphically.

### Diagram 1



In point **A** are located the initial allocations of income. In point **B** the individual **i**, according to his preferences decided to transfer part of his income to the individual **j**, which changed the distribution increasing the income of **j** and decreasing the income of **i**. The line **It** is the sum of individuals' incomes and is equal to the total income of the economy. If there is not social capital, the individual **i** is not worried about the individual **j** and the distribution would be equal to the original allocation located at point **A**, but because **i** feels sympathy for **j**, then **i** is concerned by **j** and try to benefit him transferring part of his income, thus changing the original distribution of income, standing now at the point **B**. If the final distribution has incorporated social capital this could mean that the distribution is an indirect measure of social capital. Thus, the social capital measure is the change of the initial distribution with respect to the final distribution, i.e. the difference between **A** and **B**.

On the other hand, the only thing an individual can control are the transfers granted (**Tt**). The initial income (**Io**) and the transfers received (**Tr**) are exogenous, then the variable that will determine the model is **Tt**. Therefore, the maximization problem arises in terms of transfers granted. Substituting the equation of final income and net transfer equation in the utility function of each individual will get the problem of maximization of **i** and **j**.

$$\begin{aligned} \text{Max}_{Tt_i} U_i &= (I_{o_i} + Tr_i - Tt_i)(I_{o_j} + Tt_i - Tt_j)^k \\ \text{Max}_{Tt_j} U_j &= (I_{o_j} + Tr_j - Tt_j)(I_{o_i} + Tt_j - Tt_i)^k \end{aligned}$$

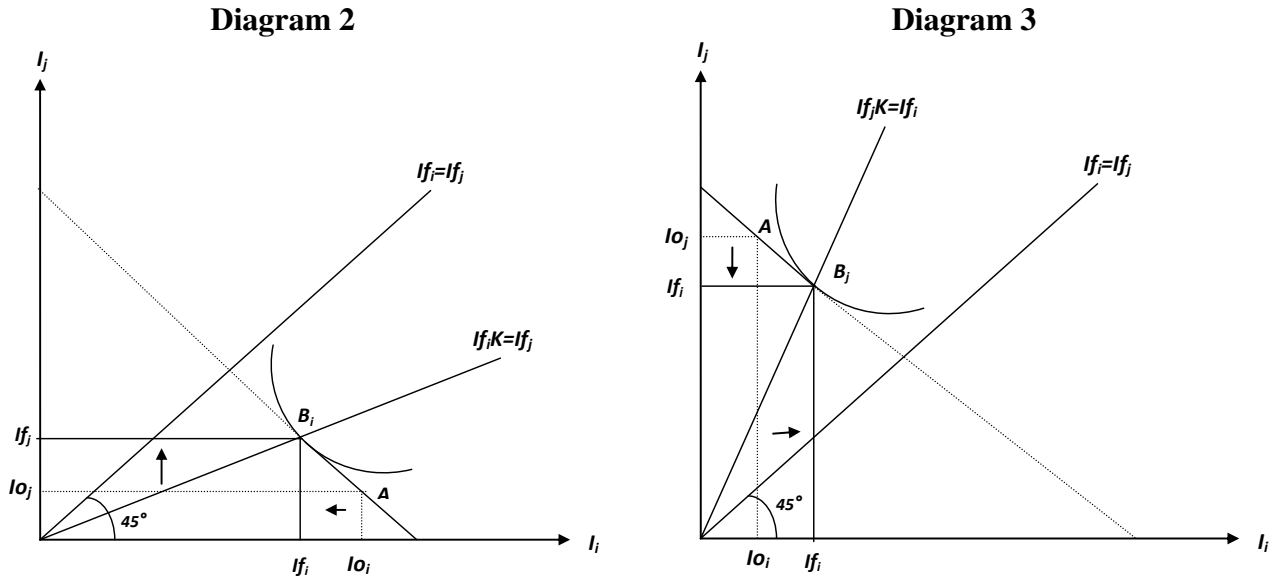
The first order conditions ( $\partial U_i / \partial Tt_i$  y  $\partial U_j / \partial Tt_j$ ) are as follows:

$$\begin{aligned} \frac{\partial U_i}{\partial Tt_i} &= -(I_{o_j} + Tt_i - Tt_j)^k + K(I_{o_i} + Tr_i - Tt_i)(I_{o_j} + Tt_i - Tt_j)^{K-1} = 0 \\ \frac{\partial U_j}{\partial Tt_j} &= -(I_{o_i} + Tt_j - Tt_i)^K + K(I_{o_j} + Tr_j - Tt_j)(I_{o_i} + Tt_j - Tt_i)^{K-1} = 0 \end{aligned}$$

Substituting again the final income of **i** and **j** individuals in the first order conditions it gives the following optimization conditions.

$$\begin{aligned} \text{For } i \quad K &= \frac{If_j}{If_i} \quad \text{or} \quad If_i K = If_j \\ \text{For } j \quad K &= \frac{If_i}{If_j} \quad \text{or} \quad If_j K = If_i \end{aligned}$$

Just one of these two conditions applies. If there is inequality the individual who has more income transfers, the individual with less income is the receiver. In this model is not possible that the two individuals transfer at the same time. The following are the transfer's allocation from  $i$  to  $j$  (diagram 2) and from  $j$  to  $i$  (diagram 3).



Considering the optimization condition of  $i$ , individual  $i$  can not receive income from  $j$ , the only thing he can do is to transfer part of his income to  $j$  for this he has to move from right to left on the line of total income. The optimization condition of  $i$  is at the point  $B_i$  ( $If_j = KIf_i$ ). The line where the point  $B_i$  is located is different to the curve of 45° because the individual is concerned about the other, but less than himself, i.e.  $K$  is smaller than one. The initial income of  $j$  is at point  $A$ .

If the initial income of  $j$  was in the point  $B_i$ , then  $i$  would no longer need to transfer part of his income to  $j$ . But if the endowment income of  $j$  is at a point on the right of the optimization condition of  $i$ , individual  $i$  can continue granting to  $j$  until the point  $B_i$ . In the event that the initial income of  $j$  is above the condition of maximization,  $i$  can not continue to grant transfers to  $j$  because that would be to move away from the point  $B_i$ <sup>5</sup>. Therefore, in the dotted line which is above the optimal point  $B_i$ ,  $i$  will not transfer income to  $j$ . This is shown in the following equations:

<sup>5</sup> If the endowment income of  $j$  is found to the left of  $A$ , and  $i$  would like to move from left to right transferring income to  $j$  to reach his optimal point, this would be like stealing income to  $j$ , producing a reduction of  $j$ 's income that instead of helping him it would hurt him. This behavior of  $i$  to  $j$  shows negative social capital.

$$\text{If } I_{O_j} \leq K I_{O_i} \Rightarrow Tt_i > 0$$

$$\text{If } I_{O_j} \geq K I_{O_i} \Rightarrow Tt_i = 0$$

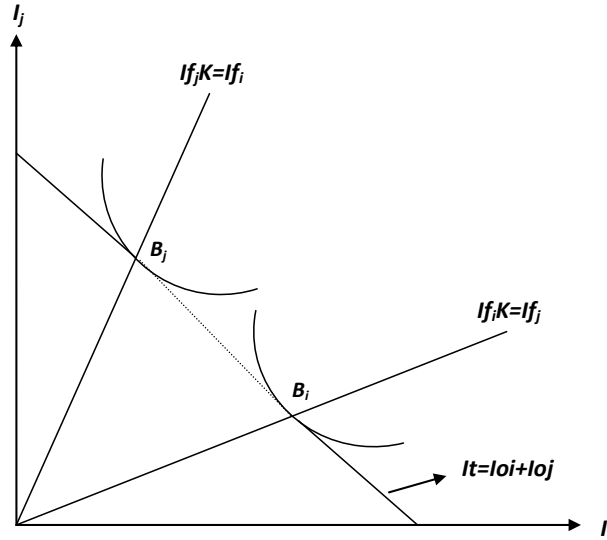
When there is social capital and  $j$  feels sympathy for  $i$ ,  $j$  will transfer to  $i$ , in doing so reduce his income by moving from left to right on the line of total income ( $It$ ). His condition optimization is in the point  $B_j$  ( $If_i = K If_j$ ). This behavior is shown in Diagram 3. In the case of  $j$ , where the initial income of  $i$  is above the optimization condition of  $j$ , as in  $A$ , then  $j$  will transfer part of his income to  $i$ , but if the initial income of  $i$  is below the point  $B_j$ ,  $j$  will not transfer income to  $i$  because if he did it he will move away from the maximization condition, hence on the dotted line that is below  $B_j$ , individual  $j$  will not transfer to  $i$ . This is shown in the following equations:

$$\text{If } I_{O_i} \leq K I_{O_j} \Rightarrow Tt_j > 0$$

$$\text{If } I_{O_i} \geq K I_{O_j} \Rightarrow Tt_j = 0$$

In the pre-conditions for maximization of  $Bi$  and  $Bj$ , where  $i$  transferred income to  $j$  and  $j$  to  $i$ , there is a relationship between social capital and inequality, in these areas one individual transfers to another and to be able to carry out such a transfer should be sympathetic relationship in which one wants to improve the other. In addition, for this to happen is necessary an inequality situation where one has more income than another and wants to benefit the other transferring some part of his own income.

**Diagram 4**



The areas where there is a relationship between inequality and social capital are located in areas not dotted of the total income line, in the spaces above the conditions of optimization. In the dotted area, although there is social capital between  $i$  and  $j$  there is no relation between social capital and inequality because there is no imbalance which encourages both  $i$  and  $j$  to transfer income away from the optimum.

In the area located to the right of  $Bi$ , where individual  $i$  transfers to  $j$ , is achieved optimization condition of  $i$  and  $j$  condition is irrelevant because it can not be reached. In the same way in the area that lies to the left of  $Bj$  where  $j$  transfers to  $i$ , the maximization condition of  $j$  is reached but  $i$  condition is irrelevant. In the dotted area may be the income of both, but their

conditions can be achieved. If a condition applies the other not, therefore, only one condition can be observed at a time. Thus, the case of individual  $i$  can be analyzed, which transfers income to  $j$ .

Previously the final income of individual  $i$  was defined as follows:  $If_i = Io_i + Tr_i - Tt_i$ , but considering the case where only the optimization condition of  $i$  applied,  $i$  only transfers income and do not get it, then his received transfers are zero and his final income is as follows:  $If_i = Io_i - Tt_i$ . Considering the individual  $j$  case,  $j$  only receives transfers from  $i$  and not grants them, then, transfers granted from  $j$  are zero and his final income is:  $If_j = Io_j + Tr_j$ . So in the case where only the  $i$ 's condition apply, the transfers that  $i$  grants are the transfers that  $j$  receives, so the transfers are redefined as  $T$  and final incomes of  $i$  and  $j$  are as follows  $If_i = Io_i - T$  y  $If_j = Io_j + T$ . Substituting these equations in the optimization condition of  $i$  the transfers given by  $i$  and received by  $i$  are obtained:

$$T = \frac{K Io_i - Io_j}{1 + K}$$

Furthermore, by substituting this equation in  $If_i = Io_i - T$  and redefining the total income as  $It = Io_i + Io_j$  final income of  $i$  is obtained which depends on the total income and the sympathy coefficient  $If_i = [It/(1+K)]$ , in the same way by replacing the transfers equation in  $If_j = Io_j + T$  final income of  $j$  is obtained, it is expressed as follows  $If_j = [KIt/(1+K)]$ . The average final income of the two individuals involved in this economy is given by  $\bar{If} = (If_i + If_j)/2$ . Now, different income inequality indices are incorporated to the model to observe the relationship of social capital with inequality. These indices are: the Robin Hood index, the coefficient of variation, the Gini index and the index of relative deprivation. These indices were selected based on the argument that the gap between rich and poor is contributing to lower levels of social cohesion and trust (Kawachi, et. al., 1997) and that inequality causes a feeling of envy and injustice that discourages investment in social capital (Podder, 1996) <sup>6</sup>.

### *Robin Hood Index*

The Robin Hood Index is defined as the proportion of aggregate income to be transferred from households above the median income to the households located below the mean in order to achieve equality in income distribution (Atkinson, 1992). Thus, the Robin Hood index in this economy is as follows:  $RH = If_i - \bar{If}$  in the case of individual  $i$ . Substituting the equations of final income and average income in the Robin Hood index, it is expressed as follows:  $RH = (If_j - If_i)/2$ . Now considering the final income of  $i$  and  $j$  in the Robin Hood index, it is redefined as follows:  $RH = 0.5 * [(1-K)It]/(1+K)$ . The Robin Hood index in absolute terms corresponds to  $RH = (If_j - If_i)/2$ , in relative terms it is given by the ratio of the index and the total income ( $rh = RH/It$ ). So replacing the equation of the RH index found in the relative Robin Hood index it is obtained the following result:  $rh = 0.5 * [(1-K)/(1+K)]$ .

<sup>6</sup> "There is a direct relationship between the degree of inequality and the extension of the injustice sense in society, with consequent dissatisfaction that causes conflicts of class," this sense of injustice caused by inequality hinders social collaboration for the welfare and discourages investment in social capital.

Thus, the Robin Hood index shows a negative relationship between social capital and inequality: the higher social capital between  $i$  and  $j$  the lower income inequality in this economy. Developing the equation of social capital, social capital is then defined in terms of inequality:  $K=[1-(2*rh)]/[1+(2*rh)]$ . In this equation the maximum value of the  $rh$  index is a half because there are only two individuals in this economy, i.e. if an individual had 100% of income it should withdraw the 50% and move to another individual to reach perfect equality. If there are a large number of individuals, the maximum value of the Robin Hood index tends to one because it has to be redistributed the 100% of income if an individual is concentrating all the income. Therefore the formula for large populations related with social capital is the following:

$$K = \frac{1 - rh}{1 + rh}$$

From this definition an inverse relationship between social capital and inequality is observed, as measured by the Robin Hood Index. It is noteworthy that the relationship between these two variables is nonlinear; an approximation could be a logarithmic functional relationship in which social capital grows more rapidly than the Robin Hood index reduces.

#### *Coefficient of variation*

On the other hand the coefficient of variation is the standard deviation between the average incomes; it can be defined as follows:

$$CV^2 = \frac{1}{n} \sum_{i=1}^n \left( \frac{If_i}{\bar{If}} \right)^2 - 1$$

Substituting equations  $If_i=[It/(1+K)]$  and  $If_j=[KIt/(1+K)]$  in the equation above would be the following expression:  $CV^2=(0.5*\{It^2/[(1+K)^2*If^2]+(K^2*It^2)/[(1+K)^2*If^2]\})-1$ . Since  $It^2/\bar{If}^2=n^2$  and  $n=2$ , then the equation above would be defined as follows:  $CV^2=\{0.5*[4/(1+K)^2+(K^2*4)/(1+K)^2]\}-1$ . Then social capital could be expressed in terms of the coefficient of variation.

$$K = \frac{1 - CV}{1 + CV}$$

It is important to observe the similarity between the equation of social capital obtained from the Robin Hood index and the results from the coefficient of variation, both equations coincide because this economy is formed by two individuals. Now, obtaining the first order condition from  $CV^2=0.5*\{4/(1+K)^2+(K^2*4)/(1+K)^2\}-1$  we obtain the following expression:  $\delta CV^2/\delta K=-[4/(1+K)^3]+[(4*K^2)/(1+K)^3]+[(4*K)/(1+K)^2]$ . From this expression it is inferred that if  $K \rightarrow 0$ ,  $i$  do not appreciate an increase in the final income of  $j$ , then  $\partial CV^2/\partial K < 0$ , i.e. a decline in social capital brings about an increase in inequality, represented by the coefficient of variation. Moreover, if  $K=1$ ,  $i$  appreciate the final income of  $j$  as much as himself, then  $\partial CV^2/\partial K = 0$ . From these it follows that at any point in the range  $0 < K < 1$ ,  $K$  increases if  $CV$  decreases.

#### *Gini Index*

The Gini index is the average relative distance of each individual with respect to the other; this can be expressed as follows:



$$G = \frac{1}{If} \frac{1}{n^2} \frac{1}{2} \sum_i^n \sum_j^n |If_i - If_j|$$

Incorporating the equations  $If_i = [It/(1+K)]$  and  $If_j = [KIt/(1+K)]$  in the above equation gives the following expression:  $G = (1/\bar{I}) * (1/4) \{ [It/(1+K)] - [KIt/(1+K)] \}$ . Developing the equation it is obtained the following relationship between social capital and inequality:  $K = (1-2G)/(1+2G)$ . As in the Robin Hood index the outcome for this equation is given for two individuals, generalizing for n individuals it would be obtained the following expression:

$$K = \frac{1-G}{1+G}$$

Again, social capital remains an inverse relationship with inequality, such behavior shows a nonlinear relationship, like the Robin Hood index and the coefficient of variation.

### *Relative Deprivation Index*

This index is an economic measure of relative deprivation; it shows the envy feeling through economic inequality. Empirical studies that have used this index relate this to social cohesion as social capital measure. Considering the case of two individuals, when an individual with envy feelings is compared with another that has no envy it arises a sense of relative deprivation (PR). Equality is the ideal state of society but if there are disparities between individuals then it is perceived disadvantage in the sense of relative deprivation.

This index does not show the same upper limits as the other indices. In the three indices above the maximum ( $M$ ) is achieved when an individual receives all the income but in the relative deprivation index the maximum is somewhere in an interior point between the upper and lower limits of the inequality. This is because individuals are not compared with the individual who possesses all the income but with the situation of the other he feels envy. Considering this, the relative deprivation index ( $IPR$ ) would be expressed as follows<sup>7</sup>:

$$IPR = \frac{PR}{M}, \quad \text{where} \quad PR = \ln If_i - \ln If_j \quad \text{and} \quad M = \left(\frac{n}{2}\right)^2 \ln\left(\frac{2It}{n} - 1\right)$$

In the equation represented by  $M$ ,  $I_i < I_j$ ,  $i$  is the individual who is disadvantaged in this economy, he is the one who expresses the sense of relative deprivation. Because  $n = 2$  in this economy, then  $M = \ln(It-1)$ . Now incorporating the incomes of  $i$  and  $j$  individuals in equations  $If_i = [It/(1+K)]$  and  $If_j = [KIt/(1+K)]$  and the maximum value ( $M$ ) for  $n = 2$ , the  $IPR$  would be as follows:  $IPR = \{ \ln[It/(1+K)] - \ln[KIt/(1+K)] \} / \ln(It-1)$ . The social capital in terms of the relative deprivation index could be expressed as follows:

$$K = \frac{1}{(It-1)^{IPR}}$$

There is also an inverse relationship between social capital and the relative deprivation index, but this relationship is different from that presented by the Robin Hood Index, the coefficient of variation and the Gini index, this is due to the difference that exists in their maximum values. Although in the equations obtained an inverse association between social capital and inequality is inferred a causality is assumed as follows  $KS = f(\text{Desigualdad})$  based on the arguments of Kawachi, et. al. (1997) and Podder (1996).

<sup>7</sup> Podder, Nripesh, "Relative Deprivation, Envy ad Economic Inequality", KYKLOS, vol. 49, 1996, Fasc. 3, pp. 353-376, ecuaciones 8, 13 y 15.

## 6. Estimation of the social capital indicator

The similarities of social capital with other capital suggests that social capital can be studied with standard economic tools, this is to invest or disinvest in social capital can be seen as an economic problem of allocating resources. Social capital is measured by its association with other variables through the extrapolation method (Heckman and Vytlačil, 2000a. 2002; Heckman et al. 1990). It is considered this method for the analysis period (1994) because there is no statistical information of social capital at the state level or municipality level which is the maximum level of disaggregation used, and it is necessary to get social capital information at the municipality level to discuss the financial information for each of the solidarity funds.

In the estimations of social capital, there are used two methods, the first is derived from the model developed and has the following functional form:  $KS=(1-D)/(1+D)$  where D is any of the inequality indexes listed in theoretical model. The second method concerns the estimation of an equation that incorporates social capital indicators and indices of inequality and that also shows a negative relationship between social capital and inequality:  $KS=\beta_1 + \beta_2 Desigualdad+u$ .

Indicators of social capital were obtained from the World Values Survey for 43 countries with market economies from the waves of the periods 1981-1984, 1989-1993, 1994-1999 and 1999-2004. These surveys were considered because they include the periods of analysis, the period for which solidarity funds information is obtained. Indicators of social capital were built from the following questions: most people can be trust, young people trust in older people, older people trust in young people, trust: other people in country, how much do you trust your family, confidence on churches, armed forces, education system, the press, the government, among others, and to belong to voluntary, ecology, human rights and social welfare among others. A pooling with the different waves was made and generates a size sample of 144 countries.

Indicators of social capital were based on Coleman (1990), Fukuyama (1995), Putnam (1993) and Gellner (1994) who believe that social capital contributes to better development of the institutions either at macro or micro level, this article will analyse the social capital in microfinance institutions such as solidarity funds. They point out that trust promotes cooperation between people and this produce a better development of the institutions because the active participation of citizens to collaborate, monitor, critique and limits restrict predatory tendencies and positively affect their performance.

Under some proves just trust indicator was statistically significative then just the trust indicator was used. The trust indicator was built using the percentage of people in a country that responded "a lot of people trust" to the question: "In general, can you trust people or you have to be very careful when dealing with them?"; for countries reported the average value was 36.6% and the standard deviation was 14.2. To construct the indicators of inequality was used the countries income from the annual report of the United Nations Development Program (UNDP) and the percentage of household income, according to the quintile in which the units are located to each of the 144 countries surveyed for a near period to the mentioned waves.

It was built a pooling data from the 4 waves used for the survey periods 1981-1984, 1989-1993, 1994-1999 and 1999-2004 to generate a sample with 144 observations, taking into account the countries that were reported in either survey. The social capital was estimated with the inequality for the period mentioned with a dummy variable for the period 1989-1993, 1994-1999 and 1999-2004 ( $\text{LnKS} = \beta_1 + \beta_2 \text{Desigualdad} + \beta_3 \text{Dummy} + u$ ). These dummies were not significatives, so we can expect that the union of the period metioned does not create problems in the estimation of social capital.

To test the relationship between social capital and income inequality the following equation:  $\text{LnKS} = \beta_1 + \beta_2 \text{LnDesigualdad} + u$ , was estimated where LnKs is the natural logarithm of the variable of social capital built with the indicators described above. We used the logarithmic form because there is theoretical evidence for the existence of a nonlinear relationship. The results obtained with OLS were:

### Estimations of the social capital indicator with four inequality indexes

$\text{Trust} = \beta_1 + \beta_2 \text{Inequality} + \dots + \beta_n X_n + u^{17}$					
Independent variables	I	II	III	IV	V
Gini <sub>1</sub>	-0.3510*** (0.1028)				
Gini <sub>2</sub>		-0.3493*** (0.0897)			
CV			-16.1594*** (5.5961)		
Robin Hood				-0.4280*** (0.1497)	
IPR					-0.2728*** (0.0952)
Education middle	-0.1086* (0.0537)	-0.0339 (0.0580)	-0.0337 (0.0584)	-0.0330 (0.0585)	-0.0346 (0.0584)
Education upper	0.1644* (0.0796)	0.1551* (0.0937)	0.1502* (0.0953)	0.1523* (0.0952)	0.1595* (0.0947)
Political corruption	-0.1075* (0.0668)	-0.1390*** (0.0669)	-0.1399*** (0.0671)	-0.1407*** (0.0671)	-0.1333** (0.0673)
Sex (male)	0.1420 (0.3343)	0.2978 (0.3318)	0.2928 (0.3399)	0.3014 (0.3398)	0.3250 (0.3388)
Age (15-29 years old)	-0.1332 (0.1260)	-0.0272 (0.1328)	-0.0263 (0.1401)	-0.0294 (0.1400)	-0.0326 (0.1392)
Age (30-49 years old)	-0.0272 (0.1546)	-0.0283 (0.1560)	-0.0228 (0.1565)	-0.0265 (0.1566)	-0.0420 (0.1566)
Stable relationship	-0.0402* (0.0428)	-0.1014*** (0.0505)	-0.1023** (0.0516)	-0.1021** (0.0516)	-0.1022** (0.0516)
Household ownership	0.2259* (0.1410)	0.1160*** (0.0533)	0.1102*** (0.0536)	0.1142*** (0.0535)	0.1224*** (0.0535)
Save money past year	0.0734 (0.0777)	-0.0608 (0.0880)	-0.0566 (0.0884)	-0.0592 (0.0885)	-0.0681 (0.0888)
Population	0.0006*** (0.0001)	0.0010*** (0.0001)	0.0009*** (0.0001)	0.0010*** (0.0001)	0.0010*** (0.0001)
GDP real	0.00001*** (0.000004)	0.00002*** (0.000004)	0.00002*** (0.000004)	0.00002*** (0.000004)	0.00002*** (0.000004)

Constant	30.5899 (16.0671)	16.3851 (15.6772)	15.2458 (16.5097)	15.5932 (16.5496)	14.1325 (16.4541)
n	144	133	132	132	132
R <sup>2</sup>	0.5075	0.5316	0.5429	0.5322	0.5324
R Adjusted	0.4624	0.4847	0.4858	0.4851	0.4852
F	11.25	11.35	11.48	11.28	11.29
F-prob	0.0000	0.0000	0.0000	0.0000	0.0000

The Gini<sub>2</sub> is referred to the adjusted Gini by population. The terms in parenthesis are referred to the values of the standard errors. Significance levels are \*\*\*(99%), \*\*(95%) and \*(90%).

The estimation was conducted using the five indexes mentioned above and the values of social capital index from the World Values Surveys for the countries reported, this was done in order to ascertain the best estimate of the capital. Only in the estimation of trust the five estimators of inequality were significant (the coefficient of variation, the Gini1 index, the Gini2 index, the Robin Hood and the Relative Deprivation index), the remainder of the estimated social capital indices were not significant. In the trust estimation the all the inequality indexes were significative but the CV show better statistical estimators. Then the coefficient of variation presented best statistical and hence was selected as the best index to estimate the social capital variable. Control variables were used to control country heterogeneity.

Once it was found the best indicator of social capital (trust) and the best proxy for estimating the social capital (the coefficient of variation) were the estimated the social capital from Mexico at state level using the values of the coefficient of variation for the country. The coefficient of variation for Mexico was built using information from the total current income of households by deciles of the National Survey of Income and Expenditure of Households comparable (1984, 1989, 1992, 1994 and 1996). The estimate of the method 1 incorporated into the coefficient of variation into the equation  $K = (1 - CV / 1 + CV)$  to get the values of the social capital for each year. This equation is derived from the indicator obtained through the theoretical model. In Method 2 it was estimated trust variable, which represents the social capital, also incorporating the coefficient of variation built and imputed from the values obtained from the coefficients  $\beta_1$  and  $\beta_2$  into the equation  $\text{LnTrust} = \beta_1 + \beta_2 \text{LnCV} + u$  where LnTrust is an nonlinear indicator and represents the trust variable and CV is the coefficient of variation. The results with both methods are presented in the following table:

**Estimations of social capital for Mexico under the two methods**

<b>Year of the ENIGH</b>	<b>Variation Coefficient</b>	<b>Method 1 <math>K = (1 - CV^1) / (1 + CV^1)</math></b>	<b>Method 2 <math>\text{Trust} = \beta_1 + \beta_2 CV + u</math></b>
1984	0.8703	0.3725	22.32
1989	1.0141	0.3049	16.85
1992	1.0251	0.3000	16.49
1994	1.0333	0.2963	16.23
1996	0.9746	0.3228	18.21

Source: INEGI, National Survey of Income and Expenditure of Household, 1984, 1989, 1992, 1994 and 1996.

<sup>1</sup> To develop the calculations there were used the adjusted coefficient of variation given by the functional form of the theoretical model.

The results of social capital obtained under the first method are related to the percentage of sympathy who feel people and is represented by the KS parameter from the utility function and correspond to an index in which a value of zero percent means that there is no social capital and 1 percent means that households have so much sympathy for others as for

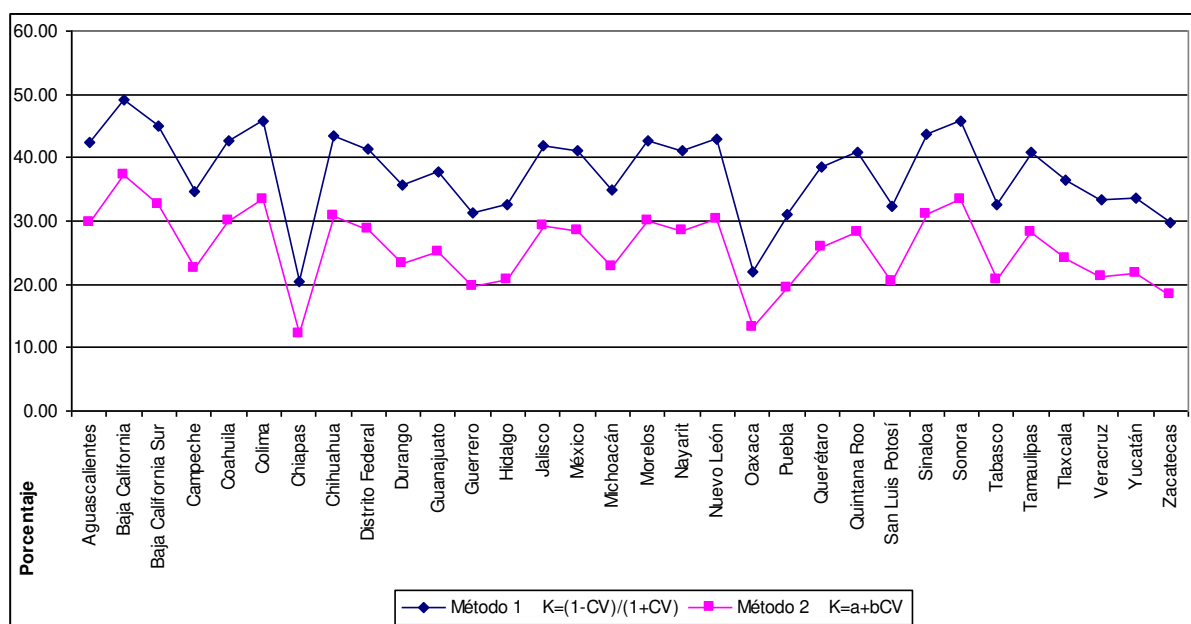
themselves. Regarding the second method, the values obtained are related to the percentage of households that trust, for example, in 1996, 18.21% percent of households reported by the ENIGH trusted people, that is, they have social capital.

The results show the following trends: 1984 to 1994 the coefficient of variation was increasing even in marginal terms this increase was shrinking. In the same way the social capital estimated under the two methods was decreasing but in smaller proportion, from 1994 to 1996 the coefficient of variation decreased and social capital, estimated under the two methods increased. Therefore there is similar trend in the the behavior of the social capital estimated under the two methods and an inverse relationship between social capital and inequality.

Once reported national results it was estimated the social capital for the states, with the two methods, but only for two years: 1990 and 1995. Were used these years because just in these years the income data are available for estates and they are the closest years for which statistics are available in the balances reported by the solidarity funds. The information corresponds to the XI General Census of Population and Housing 1990 and the Population and Housing Count 1995 from the INEGI.

The income information obtained from these two sources is concerning the distribution of population by income groups according to minimum wages, from which they were built the proportions of income generating Coefficient Variation. Below are two graphs showing the behavior of social capital in these two years, estimated with the two methods described.

**Diagram 5**  
**Behaviour of the social capital by states in 1990,**  
**estimation made with the two methods**



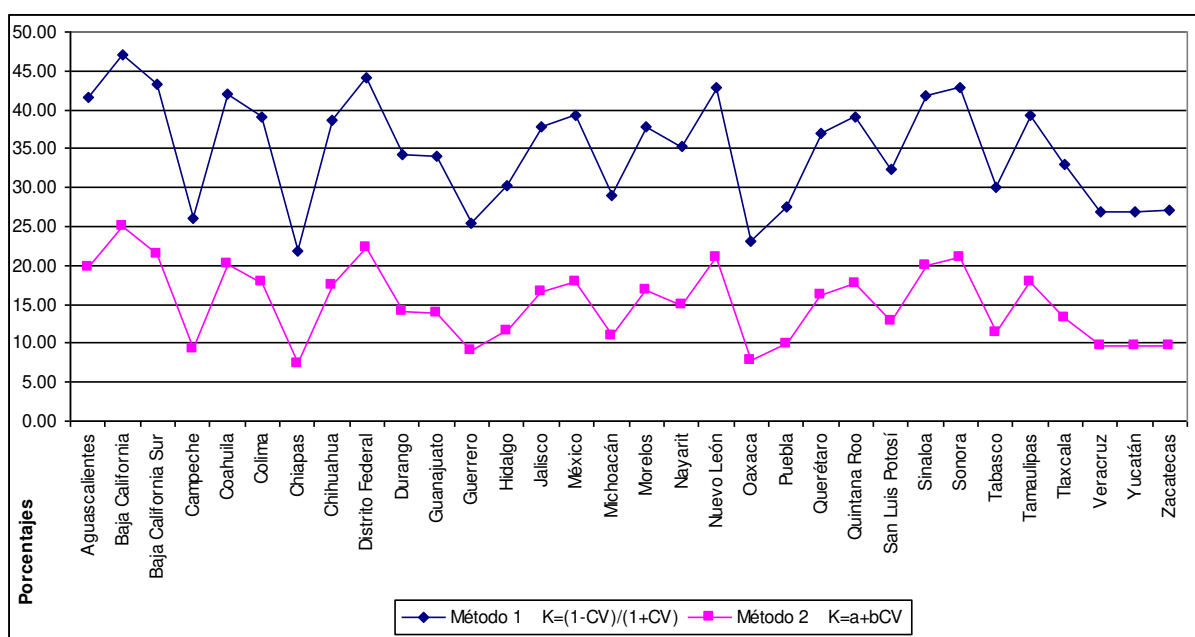
Source: INEGI, XI General Census of Population and Housing, 1990.

The results of this graph where built with the estimation of social capital with the two methods: in method 1 the coefficient of variation of each state was incorporated into the equation  $K = (1 - CV) / (1 + CV)$ , in the method 2 it was incorporated also the coefficient of

variation of each state and the values of the estimators  $\beta_1$  and  $\beta_2$  were imputed in the equation  $LnTrust = \beta_1 + \beta_2 LnCV + u$ . The Diagram 1 shows the same behavior of the social capital under the two methods.

In 1990, the five states that showed the highest social capital under the two methods were (from highest to lowest) Baja California, Sonora, Colima, Baja California Sur and Sinaloa, and those that presented the lowest social capital were (from lowest to highest ) Chiapas, Oaxaca, Zacatecas, Puebla and Guerrero. The interpretation of the value of the social capital of the first method refers to the percentage of sympathy who feel people from one state for the other. In the second method, the values obtained are related to the percentage of population of a state that trust on people.

**Diagram 6**  
**Behaviour of the social capital by states in 1995,**  
**estimation made with the two methods**



Source: INEGI, Counting of Population and Housing, 1995.

In 1995, the five states that showed the highest social capital under the two methods were (from highest to lowest) Baja California, Mexico, Baja California Sur, Sonora and Nuevo Leon, and those with the lowest social capital were (minor to high) Chiapas, Oaxaca, Guerrero, Campeche and Yucatan.

In Diagram 2 was observed, as in Diagram 1, similar behavior in the percentages reported in the two methods used for estimating social capital, i.e. the states with greater inequality also have less social capital. Additionally, there is an inverse relationship between inequality and social capital for periods from 1984 to 1994, the coefficient of variation increased and the estimated social capital fell. From 1994 to 1996, inequality declined and the social capital increase. Thus, the years in which the highest inequality was presented were also the lowest investment in capital. Although the social capital at the state level is estimated under these two different methods they coincide in their trends and their relationship with inequality. Then, social capital can be estimated using an index of inequality as proxy.

## ***7. Financial productivity of social capital: development of hypotheses***

The literature shows evidence on the productivity of social capital in the sense that it makes possible to achieve certain resources that could not be achieved in its absence or could do so only at great cost. In the case of microfinances social capital enables access to poor peasant to financial services; it helps to achieve financial sustainability by increasing their recoveries and reducing costs. To test this argument, productivity is measured through the financial products offered by the solidarity funds as they are loans and savings. The performance of the solidarity funds is estimated by debts recoveries.

In order to prove that social capital is productive in Solidarity funds it is analyzed the effect of social capital (associated with the members, their bearers) in the loans allocation, deposits and the loan recoveries. For this purpose the following hypotheses are explored: a) social capital affects the solidarity funds productivity, and b) social capital affects the financial performance of the solidarity funds.

1. One way to explain the productivity is through costs reduction and financial sustainability, this is done by expanding products, so as to generate economies of scale and the average cost of serving many small transactions begins to decrease and yields to rise (Johnson and Rogaly, 1997). The fact that social capital is productive in the solidarity funds means that there is a relationship between the outputs and inputs of the solidarity funds. The products supplied by the solidarity funds are loans and savings. The inputs are the loan assets integrated by the equity and savings. Members are also inputs because they are the bearers of social capital. The relations between outputs and inputs are as follows:
  - a) The loans assets depend on the loanable funds and the social capital.
    - i. Loanable funds consist of equity and savings. When the solidarity funds back their loans with savings can be avoided dependency which creates a greater chance of achieving long-term viability (Mansell, 1995). On the other hand, because equity are resources that belong to the members they represents a healthy way to finance and support the loans. Thus, the more equity and savings the greater loans and hence financial viability will be greater.
    - ii. Social capital contributes for the approval of loans and hence the loans allocation reducing the transaction costs because of the information flow provided with this resource.
  - b) Savings depend on the equity and social capital. Since each solidarity fund maintains its own active and passive interest rates, although these are very similar to the market and they are determined periodically by the Administration Board, there are variations in rates between fund and fund, this prevents to have registers of the interest rates. For this reason it is considered that savings just depend on equity and social capital.
    - i. Regarding equity, the greater equity the greater resources available to provide financial services in this case to capture savings or deposits.
    - ii. It can be expected that savings and investment depend on social capital, because there is greater trust from the members to the funds, this could allow increasing the deposits in them, which will generate greater financial products.
2. Social capital affects the financial performance of the solidarity funds. The recovered loans are one of the most important indicators of performance. Achieving high rates of recovery is a necessary condition for a sustainable microfinance scheme. Loan losses represent the largest cost incurred and the main cause of insolvency, lack of liquidity and

dependence on government subsidies (Jacob, 1994). It is considered that recovery depends on the following relationships:

- a) The recoveries of the borrowed funds are dependent on average loans and the social capital.
  - i. One of the main incentives for borrowers to pay their loans is the expectation that doing so will have greater access to credit. But if the program starts to indiscriminate and excessive lending is less likely to recover (Mansell, 1995). Therefore, it is expected that the relationship between loans and average recoveries were in the form of an inverted parabola, i.e. higher average loan increase recoveries, but reach a point where a larger amount lost control, and the recoveries are reduced rather than increased.
  - ii. Social capital, through its components: peer pressure and peer monitoring, allows the loans recovery. Thus, the higher social capital is higher loans recoveries will be.

### 8. Definition of the econometric equations

The hypothesis will be tested by estimating three equations which imply relations between the dependent variables (production and performance) and independent variables (equity, social capital and average loans). To test the first hypothesis, social capital is productive; they are estimated the services offered by the solidarity funds (savings and loans) through productivity equations represented by a Cobb Douglas<sup>8</sup> type of production as follows:

$$Y = A X_1^{\beta_1} X_2^{\beta_2}$$

where  $Y$  refers to the product offering the solidarity funds,  $X_1$  is the input given by the amount of fund resources and  $X_2$  is the social capital associated with the producers. By replacing the outputs  $Ys$  and inputs  $Xs$  and applying logarithms the following functions are obtained:

$$LnLoans = C + \beta_1 Ln(Equity + Savings) + \beta_2 Ln(Members * SocialCapital) + u \quad (1)$$

$$LnSavings = C + \beta_1 Ln(Equity) + \beta_2 Ln(Members * SocialCapital) + u \quad (2)$$

Products are given by the number of loans and the number of savings. Considering the number and not the amount because the fund transactions reflect the number of operations performed and not the amount of them. For example, a producer may be received a loan of 500 pesos but 5 people may be receive a loan of 100 pesos. The second operation involves more transaction costs than the first and this does not mean that the number of transactions being carried out is less.

It is proposed a production function with constant returns to scale<sup>9</sup>, the factors coefficients represent elasticities products. In equation (1) the product depends on the amount of resources

<sup>8</sup> It was considered a Cobb Douglas function because two characteristics: constant returns to scale (homogeneity of degree 1) and the marginal productivity which is positive and decreasing ie marginal returns of productive inputs.

<sup>9</sup> Production increases in the same proportion that inputs increase  $X_i$  and  $X_j$ . The existence of constant returns to scale allows to consider the inputs returns according to their marginal productivity, ie :  $Y = Pmg_{xi} X_i + Pmg_{xj} X_j$ . In the case of decreasing returns to scale ( $Y < Pmg_{xi} X_i + Pmg_{xj} X_j$ ) production would increase by less than the input, therefore, the product would be insufficient to make payments to those factors according to their marginal productivity, and respect to increasing returns to scale the product would be greater than that payment.



available to loan, these come from the equity and the amount of savings. In equation (2) the product depends on the equity. The two equations depend on the social capital that is embodied by the producers, more producers in the solidarity fund more strengthens the Fund's social capital.

To test the second hypothesis, social capital affects the financial performance of the solidarity funds, it is used an equation that considers recoveries. It is introduced a squared term because it assumes a parabolic relationship where it is expected a positive relationship between the average recoveries and loans and a negative relationship with average loans squared. This variable was included because it can capture the trend in the average loan and recoveries after reaching the peak. The proposed equation is the following:

$$\text{Recoveries} = C + \beta_1 \text{Average Loans} + \beta_2 \text{Average Loans}^2 + \beta_3 \text{Social Capital} * \text{Members} + u \quad (3)$$

Recoveries relate to the amount of loan payed, the average loan to the amount of resources allocated for producer and social capital is again a variable that is incorporated into the number of producers.

It is expected a positive relationship between the average loans and the recoveries because the highest average loans the producers will have greater incentives to increase recoveries (it refers to the tiered system of credits). The system works as follows, loans are granted to producers if they pay their loans they are candidates for a higher credit but if they do not pay or incur in moratorium they are not eligible to apply for another loan. Thus, the funds can allocate loans to the highest point where they can control the recoveries, beyond that limit average loans instead of represent an incentive to the recoveries it may cause frauds and decapitalization for the funds. The highest point is the following:

$$\frac{\partial \text{Recoveries}}{\partial \text{Average Loans}} = \beta_1 + 2\beta_2 \text{Average Loans} = 0$$

Resolving it is obtained the maximum value of the average loans, which is a function of the estimators  $\beta_1$  and  $\beta_2$ .

$$\text{Value that maximizes the average recoveries of loans} = -\frac{\beta_1}{2\beta_2}$$

On the other hand, social capital acts as an advocate for recoveries by selecting the best candidates to credit through the information flows, the peer pressure and the peer monitoring. Thus, it is expected that a greater investment in social capital allow greater loan recoveries of loans. The variables used in equations (1), (2) y (3). are described as follows:

- a) *LLoans*. Are the loans logarithms and are of two types: a) automatic loans and b) solidarity loans they are allocated with the approval of a voluntary endorsement.
- b) *LLending Funds*. Refers to the sum of the equity and the amount of savings in current pesos. The equity is comprised of three funds: a) the general reserve, it contributes to financial autonomy of the funds and could be used to provide loans, b) contingency fund is used to cover any eventuality regarding a financial deficit of the fund, and c) promotion and social development is used to support community projects. The amount

of savings relates to the resources from the deposits of members through the various accounts that record the funds.

- c) *LSocialKT*. It refers to the social capital indicator that was built with the 1st. method  $K = (1-CV) / (1 + CV)$  using the adjusted coefficient of variation. The term describes the relationship between this input with their carriers,  $SocialKT = \text{social capital} * \text{producers}$ .
- d) *LSavings*. Refers to the number of transactions from the various savings accounts that record the funds as current accounts, systematic savings, youth savings and time deposits.
- e) *LEquity*. It refers to equity described above.
- f) *Recoveries*. It refers to the total amount of recoveries that are obtained from the loans allocated and is the difference between loans allocated and current loans. The current loans are those offered by the Funds and are payable in whole or in part, it includes the default loans but excludes the overdue loans.
- g) *Average Loans*. The amount of loans given by the number of members in each solidarity fund.

The information of the indicators was obtained from the financial results reported by the Solidarity funds at the end of each year except the coefficient of variation; this was built with income information of the population living in the municipalities where the funds are located. This information refers to the employed population by level of monthly income in minimum wages registered by the XI General Census of Population and Housing, 1990, from the INEGI. It was took the 1990 Census because is the information at the municipal level closest to 1994 that is the year for which information is available from the profits and loss statement of the solidarity funds.

## 9. Estimación de las ecuaciones econométricas

It was used a sample with 54 observations of the 118 Solidarity funds registered in 1994 at the municipal level. The selection of this sample size deserves further explanation. The funds were constituted in 1992, formally began operations in 1993, his first state of results in FONAES was in December 1993. That year the majority of funds had not reported recoveries because they distributed credits just few days before or because of the lack of financial accounting knowledge with the funds operate. Thus, in December 1994, the second year in which they report their results, only 54 of them provided information on loans, savings and recoveries. Applying the method of ordinary least squares in the three cross-section equations the following estimators were obtained.

Independent Variables	Dependent Variables		
	LnLoans	LnSavings	LnRecoveries
Ln <sup>1</sup> Loan Funds	0.7687*** (0.1820)		
LnEquity		0.7684*** (0.6478)	
Average Loans			509.3913*** (37.0145)
Average Loans <sup>2</sup>			-0.0273*** (0.0024)
Ln SocialKT	0.2927*** (0.1351)	0.5874*** (0.4142)	627.7429 <sup>3</sup> *** (102.3964)
Constant	-6.6022***	- 5.214**	-198693

	(2.4718)	(4.4987)	(168445.8)
Percentage de illiterate population over 15 years old.	-0.0230* (0.0153)	-0.0057 (0.0392 )	5511.886 ( 4693.434)
Percentage of population without primary completed aged 15 and more years old	0.0109 (0.0119)	0.0157 ( 0.0297)	1149.41 ( 4726.741)
Percentage of households' occupants without toilet or drainage.	0.0072 (0.0071)	-0.0141 (0.0201)	-971.921 ( 2024.441)
Percentage of households' occupants without electricity.	-0.0015 (0.0079)	-0.0027 ( 0.0253)	672.0309 ( 2181.835)
Percentage of dwellings without piped water.	-0.0011 (0.0071)	0.0202* (0.0187)	3177.239* ( 1877.545)
Percentage of households with overcrowding	-0.0173* (0.0109)	-0.0238 ( 0.0309)	-1886.447 ( 2543.655)
Percentage of occupants in houses with dirt floor	0.0118** (0.0065)	-0.0207* ( 0.0167)	-1925.089 ( 2455.353)
Percentage of population in localities with fewer than 5,000 inhabitants	-0.0045 (0.0053)	0.0209** ( 0.0124)	-358.7182 ( 1473.258)
Percentage of population with income less than 2 minimum wages	-0.0168** (0.0097)	-0.0455** ( 0.0247)	-4163.998** ( 2306.558)
n	54	46	42
R <sup>2</sup>	0.5945	0.5247	0.9119
R <sup>2</sup> adjusted	0.4883	0.4315	0.8754

<sup>1</sup> Ln=natural logarithm; <sup>3</sup>there are not included logarithms only in this term because the functional form of the recoveries equation. The terms in parentheses refer to the values of the standard errors. Significance levels are \*\*\*(99%), \*\*(95%) y \*(90%). The variables were significative in the joined form. <sup>10</sup>

Control variables were used from the marginalization index of CONAPO, 1990, such as population size, the percentage of illiterate population over 15 years, the percentage of population without complete elementary school aged 15 years, the percentage of occupants in houses without drainage or excused, the percentage of occupants in houses without electricity, the percentage of occupants in houses without piped water, the percentage of households with overcrowding, the percentage of occupants in houses with dirt floors, the percentage of the population in localities with fewer than 5,000 inhabitants, the percentage of the population with income less than 2 minimum wages. We included these variables as controls in order to analyze the effects of social capital in the financial behavior in the municipalities where access to financial services is limited and because the degree of marginalization of a municipality is highly correlated with lack of access financial services Yaron, J. (1994) <sup>11</sup>.

En las tres ecuaciones los resultados econométricos reportan que el capital social fue significativo en los préstamos, ahorros y las recuperaciones. En los tres casos el signo es positivo. No se observa un patrón de comportamiento en las variables control, con excepción del indicador: porcentaje de población ocupada con ingreso menor de 2 salarios mínimos, que fue estadísticamente significativo en las tres ecuaciones. Es decir, cuando las personas ganan menos de dos salarios mínimos perciben menos préstamos, ahorran menos y también recuperan menos. Aislando los componentes y estimando las tres ecuaciones pero ahora sólo con el índice de marginación integrado se tiene lo siguiente:

<sup>10</sup> F-estadistic is 5.60, 2.50 and 25.01, respectively and it probability is 0.0000 in the three cases.

<sup>11</sup> In 2000, only 13% of municipalities with high and very high marginalization in Mexico had some kind of financial intermediation in the region. Source: The portal of microfinance in Mexico <http://www.microfinanzas.net>

In the three equations econometric results reported that social capital was significant in loans, savings and recoveries. In all three cases the sign is positive. It was not observed a behavior pattern in the control variables, with the exception of the indicator: Percentage of population with income less than 2 minimum wages, which was statistically significant in all three equations, i.e. when people earn less than two minimum wages they save less and less recovery. Isolating the components and estimating the three equations but only with the marginalization index integrated the results are as follows:

Independent variables	Dependent variables		
	LnLoans	LnSavings	LnRecoveries
Ln <sup>1</sup> Loan Funds	0.7255*** (0.1668)		
LnEquity		0.7012** (0.6887)	
Average Loans			505.9847*** (31.1905)
Average Loans <sup>2</sup>			-0.0273*** (0.0019)
LnSocialKT	0.2302*** (0.1296)	0.5557*** (0.4434)	596.4765 <sup>3</sup> *** (95.0629)
Constant	-5.0011** (1.9213)	- 5.6483** (4.4871)	-454341.7** (57084.64)
Margination Index	0.1736** (0.0965)	-0.2958** ( 0.1499)	60.493*** ( 20844.21)
n	54	42	42
R <sup>2</sup>	0.4971	0.5014	0.8878
R <sup>2</sup> adjusted	0.4669	0.4011	0.8757

<sup>1</sup>Ln=natural logarithm; <sup>3</sup>there are not included logarithms only in this term because the functional form of the recoveries equation. The terms in parentheses refer to the values of the standard errors. Significance levels are \*\*\*(99%), \*\*(95%) y \*(90%). The variables were significative in the joined form. <sup>12</sup>

Again, in the three equations social capital was significative with positive sign. It was observed that when the equations were estimated with the marginalization integrated index it has an effect on the loans, savings and recoveries. That is, when the members of the solidarity funds are located in marginalized municipalities in the percentage of loans is higher but the percentage of savings is lower (perhaps because the income effect), although the amount of recoveries is greater.

In the first equation it is observed that 49.71% of the variation in loans is explained by the variation in the loanable funds and social capital. It can be inferred that the services provided by the solidarity funds via loans depend positively on the amount of resources available to loan compounds of the equity and savings, and social capital. It also follows that greater resources available to the Fund, the greater the number of loans to be granted, so too does social capital, the greater social capital is the more loans will be allocated. It was also demonstrated that there are constant returns to scale<sup>13</sup>, which means that if the amount of each factor doubles (equity+savings and social capital) also doubles the number of loans that are granted, *ceteris paribus*. Substituting the values of the estimated coefficients in the production function it is as follows:

<sup>12</sup> F-statistic was 16.47, 13.39 and 73.19, respectively, and the probabilidad was 0.0000 in the three cases.

<sup>13</sup> Wald test (F-statistic was 0.8013 and probability was 0.4012).

$$\text{Loans} = 0.006 \text{ Loan Funds}^{0.7255} \text{ SocialKT}^{0.2302}$$

The value of the constant means that if the loanable funds and social capital are equal to one the loans value is 0.006%<sup>14</sup>, *ceteris paribus*, ie, when the amounts of equity and savings are small and the sympathy between members is very low the amount of loans that is granted is minimal and zero when they are close or equal to unity.

The loanable funds and social capital coefficients are the product elasticities of the loans. Thus, an increase of 1% loanable funds generate an increase of 0.7255% in loans given, *ceteris paribus*. In the same way if the social capital rises by 1% the product (measured by the loans) increases by 0.2302%, *ceteris paribus*. Although social capital has a significant impact on the loans allocation that is lower than that of loanable funds, ie the provision of funds affects more than the existence of the total social capital to give more loans. After estimating the second equation the values of the coefficients are obtained and they are replaced in the production function as follows:

$$\text{Savings} = 0.003 \text{ Equity}^{0.7012} \text{ SocialKT}^{0.5557}$$

From these results it appears that changes in equity and social capital explain 50.14 percent in the variations in the number of collected savings. It can be inferred that the services provided by the solidarity funds via savings depend positively on the amount of resources for financing and depend also on social capital. In this regard, most available resources, by expanding the equity, generates greater savings collection, in the same way, the more social capital leads to greater confidence in the resource deposit in the solidarity funds. There were also constant returns to scale<sup>15</sup>, which means that if the amount of equity and social capital doubles, the number of savings that are captured doubles too.

It also follows that the value of savings is 0.003<sup>16</sup> if the equity and social capital are equal to one, in other words, when the amount of resources to finance is small and sympathy that exists between members is very low, the amount of savings that is captured is minimal, or zero if they are close or equal to unity, *ceteris paribus*. The equity and social capital coefficients represent the elasticities product of the savings. Thus, an increase of 0.7012% in the savings is produced by a 1% increase in wealth, *ceteris paribus*. In the same way, the product (measured by the number of savings) rises at 0.5557% if the social capital increases by 1%, *ceteris paribus*. Again, social capital has a significant effect in attracting savings, but it is less than the equity, ie, the provision of resources affects more to finance than existence of social capital to attract more savings.

In the same way, using the sample with 54 observations they were estimated coefficients of the third equation. The 88.78% of the variation in recoveries was explained by the variation in average loans, square average loans and the social capital. It can be inferred that the performance of the funds (measured by recovery) depends positively on the amount of loans allocated by the producer, negatively on the square average loans and positively and positively on the existing social capital. Substituting the values of the estimated coefficients in equation three is as follows:

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<sup>14</sup>  $\exp^{-5.0011} = 0.006$

<sup>15</sup> Wald test (F-statistic was 0.9889 and probability was 0.1758).

<sup>16</sup>  $\exp^{-5.6483} = 0.003$

$$\text{RECOVERIES} = -454341.7 + 505.98 \text{AVERLOANS} - 0.0273 \text{AVERLOANS}^2 + 596.47 \text{SOCIALKT}$$

From the estimations it is inferred that if total social capital increases by one unit the amount of recoveries is increased by 596.47 pesos, *ceteris paribus*. The interpretation of the above implies that for every additional producer that owns and activates their social capital with his partners it will be generated increases in recoveries of loans by an amount of 596.47 pesos. In this sense, a greater investment in social capital will recover a greater amount of borrowed funds. In the same way if the average loans in each Fund increase in one unit the amount of recoveries will increase by 505.98 pesos, *ceteris paribus*. If the square average loan in each fund increases in one unit the amount of recoveries is reduced by 0.0273 pesos, *ceteris paribus*. In this way a larger amount of average loans by Fund generate recoveries of the resources but after reaching a certain value they begin to decline with increased average loans. In marginal terms increases in recoveries due to the increase in average loans will be higher than the reductions before reaching the maximum value. The peak is reached at:

$$\text{Value that maximizes the recoveries of the average loans} = - \frac{505.98}{(2)(-0.0273)} = 9,267.03$$

The above result comes from the maximization of recoveries and implies that by increasing the solidarity funds loans per member by a unit the recoveries are increased by about 505.98 pesos on average, but after that the loans exceeded the amount of 9267.03 pesos the recoveries start to decrease by around 0.0273 pesos per average loan additional. If the social capital and marginalization index had a value of zero at the inflection point recoveries would be of 1,890,168.53 pesos. Loans by a producer in the sample of 54 observations are of 1,966.44 pesos on average and the amount of recoveries of 410,591.11 pesos on average, meaning that funds may still allocate loans per producer of 7,300.59 pesos on average before reach the peak and start to experience reductions in their recoveries.

The constant has a special treatment in this equation. Since negative values of the constant have non sense from the recoveries, the constant would only get the value of average loans when the recoveries are not obtained, which could be reached in 951.75 pesos in the case of social capital and the marginalization index had a value of zero.

It is important to note that although the amount of loans given to producers affected significantly the amount of recoveries the greatest effect is produced by the total social capital. Thus, it is expected that a greater investment in social capital allow greater recoveries of loans.

From the results obtained of the estimation of the third equation it is inferred that the recoveries of the borrowed funds are dependent on average loans and the social capital. Furthermore, it shows that social capital positively affects the performance of the solidarity funds via recoveries and they have a different behavior with the increase in average loans. Therefore, it can concluded that social capital has a significant effect on productivity of the solidarity funds in the sense that it helps to attract more savings and to allocate more loans and it also affect the financial performance of the funds.

## 9. Conclusions

Classical economic theory assumes that the relations of sympathy or antipathy between individuals do not substantially affect the outcome of transactions. This implies that the social distance between suppliers and purchasers is often very large and these relations do not affect prices and quantities that are assigned or taken on the market. However, evidence suggests that relationships matter. They can alter and modify terms of market performance. Social capital refers to networks, norms and trust that facilitate cooperation for mutual benefit.

Given that social capital makes it possible to achieve certain resources that could not be achieved in its absence or could do so only at high cost, this allows for poor producers have access to financing and helps microfinance schemes reach their financial sustainability. In Microfinance, social capital works by solidarity bonds, neighborhood and community organization, operates under the mechanisms of peer pressure and peer monitoring which allows them to minimize costs of monitoring and credit analysis. The problem of adverse selection is minimized because members select their peers to participate in these schemes. Its members use the social collateral for obtaining loans and as security for loan repayment, its principal asset is the trust that exists between them.

Social capital in the solidarity funds is expressed by the participation, trust and responsibility of the members. They take the voluntary decision to constitute the funds with the loan recoveries given by government programs. They decide who can be the new member based on information they have on the reliability and ability to pay of the members of their communities. They are owners of these mechanisms and responsible for the recovery of resources at the same time, they are also responsible for monitoring and evaluating the solidarity funds. Their participation in the creation, discussion of operation rules and monitoring has contributed to the organization and evolution of the solidarity funds. By the peer pressure and peer monitoring scheme they have reduced the problems of fraud or default, which has helped to reduce the risk of bankruptcy and prevent its spread to other regional economic sectors.

In order to prove that social capital is productive in the solidarity funds the social capital effects were analyzed (associated with the members) in the loans allocation, collection of savings and the recovery of loans. To this objective it was explored the following hypotheses: a) The social capital can be estimated through an index of inequality by using extrapolation method; b) The social capital affects the productivity of the solidarity funds, and c) social capital affects the financial performance of the solidarity funds.

From the results obtained in testing the first hypothesis by the extrapolation method it was inferred the inverse relationship between social capital and inequality in two ways with five indices of inequality and trust indicators of social capital. The results show that the best proxy for estimating the social capital is the coefficient of variation. To verify this relationship the social capital was estimated at country level and states level under the two methods. The results showed a similar trend in their behavior and an inverse relationship between the variables of social capital and inequality. Thus, the years in which the highest inequality was presented are also the years with lowest investment in capital capital. In the same way, the states that showed the highest rates of inequality are also those who had the lowest percentages of social capital.

To test the second hypothesis they were estimated the services offered by the solidarity funds (number of loans and savings) through two productivity equations represented by production

functions Cobb Douglas type. The inputs considered were loanable funds, equity and social capital. From these results it was deduced that the services provided by the funds via loans depend positively on the amount of resources available to offer loans and the existing social capital. It was also noted that greater resources available in the Fund, the greater the number of loans to be granted and greater the social capital the greater loans to be allocated. In the same way it was observed that the number of savings transactions made depends positively on equity and social capital; it was noted that the greater provision of resources through the expansion of equity, generate greater savings and more social capital generate greater confidence to deposit resources in the solidarity funds.

To test the third hypothesis it was estimated a performance equation through recoveries. The results shows that the funds performance, as measured by recoveries, depends positively on the amount of loans allocated per member, depends negatively on square average loans and positively to the existing social capital. It was also noted that the higher average loan recoveries increase, but reach a point where a larger amount of loans loses the control of the recoveries and instead of increase recoveries they are reduced.

Additionally it was found that a greater investment in social capital will recover a greater amount of borrowed funds. It was noted that although the amount of loans granted by producer affects the amount of recoveries, the greatest effect is produced by social capital. Thus, it is expected that a greater investment in social capital allows higher loan recoveries.

It was analyzed the importance of social capital in the sense that the performance and productivity of a microfinance program can be expanded or limited by its social capital. However, these conclusions were deduced from a scheme with government participation, it is questionable whether public efforts in the allocation of credits can be successful without sufficient levels of social capital provided by the members. Therefore it is appropriate to examine the assumptions outlined in microfinance schemes without government involvement, such as FINCA, CAME, among others.

The solidarity funds do not have the authorization from CNBV to operate as EACPs in terms of the LACP because they are civil societies. This status limits the development of these financial funds and prevents them from the backing of the banking authorities, this is not a serious obstacle to their development, but may be in the future. So, while for internal management, the funds have statutes and operation rules approved by the membership, it is necessary that they were supported and backed by the appropriate legislation. In this sense, social capital has a special advantage on the legal aspect of the solidarity funds, its operation mechanisms, supervision and funds control gives them confidence and certainty to the members on the use and recovery of resources. Otherwise this could not be observed because the funds legal situation under can not be governed by other statutes and do imply a high cost for the funds or change its social denomination.

Perhaps the most important conclusion is that the relationships influence the products and the loans recoveries, and then the economic recommendations include actions to build, maintain and increase social capital. Investment in social capital can be achieved when individuals are involved in cooperative or synergistic activities in which those involved have an interest in the success of others, and therefore have more communication, share common causes and responsibilities, offer more favorable trade terms, create social bonds and interact for the



benefit of the community. The design of social programs that are based or encourage participation may boost this kind of synergistic activities.

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